Module 1

Human Performance Improvement

September 28, 2009 **8:30–12:00**

NUCLEAR EXECUTIVE
LEADERSHIP TRAINING

NUCLEAR EXECUTIVE LEADERSHIP TRAINING

Human Performance Improvement

W. Earl Carnes

Earl Carnes is the DOE Senior Program Manager for Human Performance and the DOE liaison with the Institute of Nuclear Power Operations. In his current position, Earl works with DOE and DOE contractor's to facilitate implementation of Human Performance Improvement concepts, principles and tools. He has also supported the International Atomic Energy Agency in developing guidance on human performance and knowledge retention. His 15 years experience with DOE previously included assignments as the lead for Emergency Management for the Office of Nuclear Safety and responsibilities for safety directives in the Office of Nuclear Safety Policy and Standards.

Prior to joining DOE, Earl spent 15 years in the commercial nuclear power industry; first managing a nuclear education program and serving as the principal nuclear spokesperson for a utility, then serving with the Institute of Nuclear Power Operations, and as a management consultant focusing on start up and troubled commercial nuclear plants. Through these experiences he had a unique opportunity to observe successful and not so successful management and leadership practices in over 40 commercial nuclear plants. He also held positions at two universities as an instructor and researcher in communication.

Earl earned a B.S. degree in Chemistry, a Masters degree in Communication, a certificate in Human Performance Technology from the American Society of Training and Development, and completed doctoral course work in Engineering Management. He is a member of the International Society for Performance Improvement

Michael A. Schoener

Mike Schoener is the owner and a Principal Consultant with MAS Consultants Inc., an Aiken, SC firm that provides management, technical and organizational improvement services for commercial and government organizations. He has over 30 years of experience in the areas of management, facility operations, training, organizational development and facilitation. He provides management consulting services for electric utilities, process industries, craft labor unions and government agencies. Clients include organizations such as U.S. Department of Energy (DOE), Centers for Disease Control and Prevention (CDC), Chevron Oil, Cleveland Electric Illuminating, Lockheed Martin Energy Services, Ontario Power Generation, United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry, and Stone & Webster Engineering.

Mr. Schoener has been the manager of technical training at a commercial nuclear utility, manager of training and procedures assisting in the startup of a troubled DOE nuclear facility, and worked with executives at Ontario Hydro and Ontario Power Generation to make significant organizational and programmatic improvements to upgrade the training and certification programs for their nuclear operations in Canada. He developed the one-week, in-residence, Nuclear Executive Leadership Training (NELT) for senior DOE executives and has conducted management retreats for DOE executives in several different organizations. He assisted the US Department of Energy by designing and developing the initial Technical Qualification Program (TQP) to upgrade the technical competence of the Federal workforce across the country. He assisted DOE with the start-up the Human Performance Center and has worked with various organizations across the DOE complex to assist with HPI implemenation. He also served as the facilitator for the SRS Citizens Advisory Board.

Mr. Schoener has a Bachelor of Science in Construction Management from Bowling Green State University where he graduated Magna Cum Laude. He served a six year tour in the Navy Nuclear Power Program. He is a member of the American Nuclear Society and the American Society for Training and Development. He also is a licensed residential builder.

NUCLEAR EXECUTIVE LEADERSHIP TRAINING

Human Performance Improvement

Earl Carnes

Mike Schoener

September 28, 2009

Course Purpose

NUCLEAR EXECUTIVE LEADERSHIP TRAINING

GOAL

Provide attendees with an overview of Human Performance Improvement (HPI) concepts, principles, and application.

OBJECTIVES

- Describe the difference between errors and violations, the two different types of errors and violations, and why individuals commit each.
- List and describe the three performance modes and discuss how they can be used in applying HPI concepts and principles.
- Explain the anatomy of an event model and the describe each of the major elements.
- Discuss the role and effect of leadership as it relates to HPI
- Describe the just culture concept and the relationship between it and the reporting and learning culture.

Human Performance

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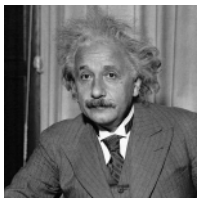
"The significant problems we face cannot be solved at the same level of thinking we were at when we created them."



Albert Einstein

US Nuclear Trends

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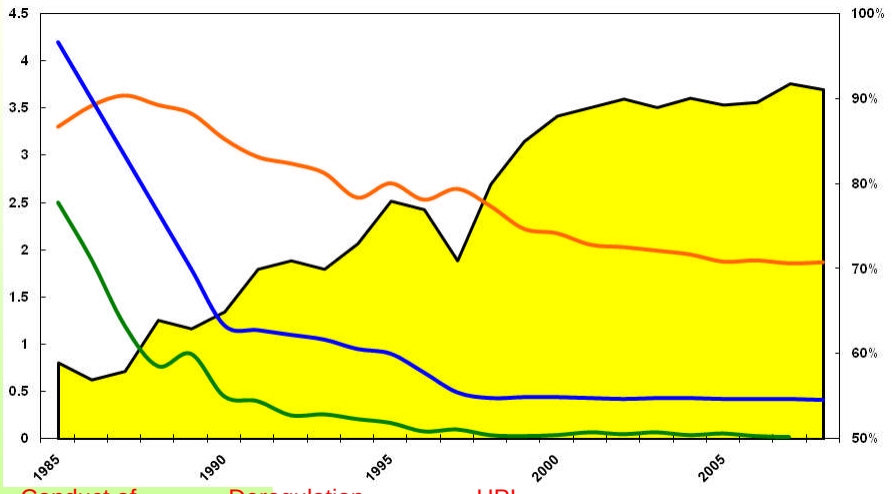

Conduct of… Deregulation……. HPI……..

Why a Human Performance Approach?

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Human Performance = Behavior + Results

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What is Human Performance?

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An individual…

working within organizational systems…

to meet expectations set by leaders.

What is an Error?

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An **error** is a human action that unintentionally departs from an expected behavior

Principles of Human Performance

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1. **People are fallible**, and even the best make mistakes.
2. **Error-likely situations are predictable**, manageable, and preventable.
3. **Individual behavior is influenced** by organizational processes and values.
4. **People achieve high levels of performance** based largely on the encouragement and reinforcement received from leaders, peers, and subordinates.
5. **Events can be avoided** by understanding the reasons mistakes occur and applying the lessons learned from past events.

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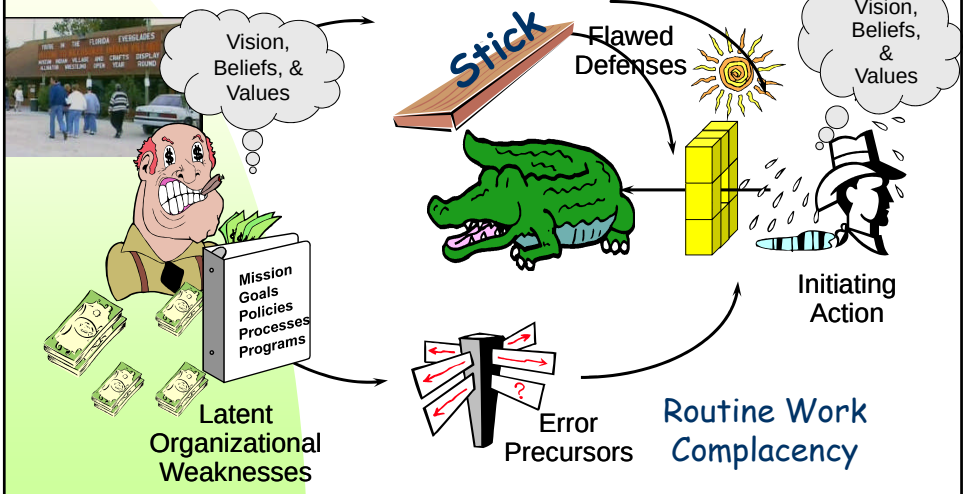
Anatomy of the Alligator Accident

Flawed defenses allow the consequences of the act to propagate



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Reducing Human Error

The Individual & Environment

$$R_e + M_d = \text{ØE}$$

TP NELT 9-12

What is an Error?

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An **error** is a human action that **unintentionally** departs from an expected behavior

Two Kinds of Error

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Active Error →

← Latent Error

Active Error

Action (behavior) that changes equipment, system, or physical state triggering ***immediate*** undesired ***consequences***.

Latent Error

An error, act, or decision that results in organization-related ***weaknesses or*** equipment ***flaws that lie dormant*** until revealed either by human error, testing, or self-assessment.

Active vs. Latent Error

Characteristics	Active	Latent
Who?	Front Line Workers	Mgmt & Staff
What?	Physical Changes	Paper & Policy
When?	Immediate Consequence	Delayed Consequence
Visible?	Yes	No – Not Obvious

What is a Violation?

Intentional deviation from a policy or procedure requirement for personal advantage, usually adopted for fun, comfort, expedience, or convenience

People tend to violate expectations when…

- "We've always done it this way"
- "Everyone does it!"
- Low potential for detection
- Absence of authority in the vicinity
- Peer pressure by team or work group
- Standard appears unimportant
- Unawareness of potential consequences
- Competition with other individuals/groups
- Interference or obstacle to achieving goal
- Conflicting demands or goals

Limitations of Human Nature

- **Stress**
- Avoidance of **mental strain**
- Inaccurate **mental models**
- Limited working **memory**
- Limited **attention** resources

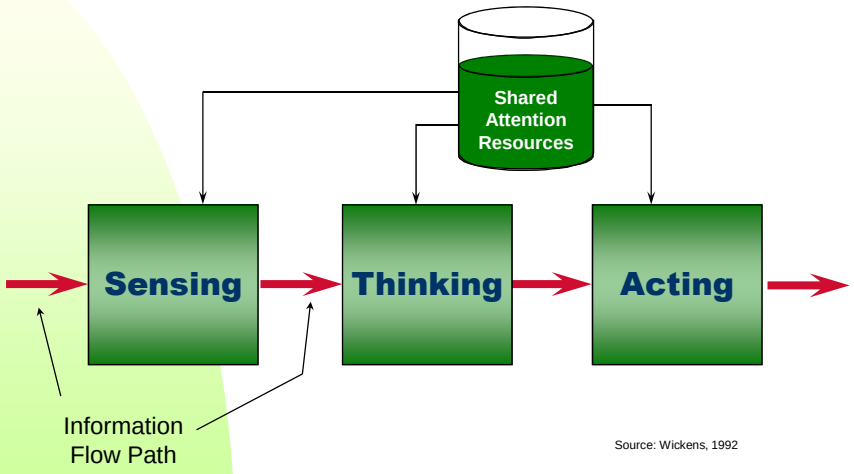
Limitations of Human Nature

- Mind **set**
- Difficulty **seeing** own errors
- Limited **perspective**
- Susceptible to **emotion**
- Focus on **goal**
- Poor perception of **risk**
- **Fatigue**

Hazardous Attitudes

- **Heroic** "I'll get it done, hook or by crook."
- **Pride** "Don't insult my intelligence."
- **Invulnerable** "That can't happen to me."
- **Fatalistic** "What's the use?"
- **Bald Tire** "Got 60K miles and haven't had a flat yet." ("It's a routine job!")
- **Summit Fever** "We're almost done."
- **Pollyanna** "Nothing bad will happen."

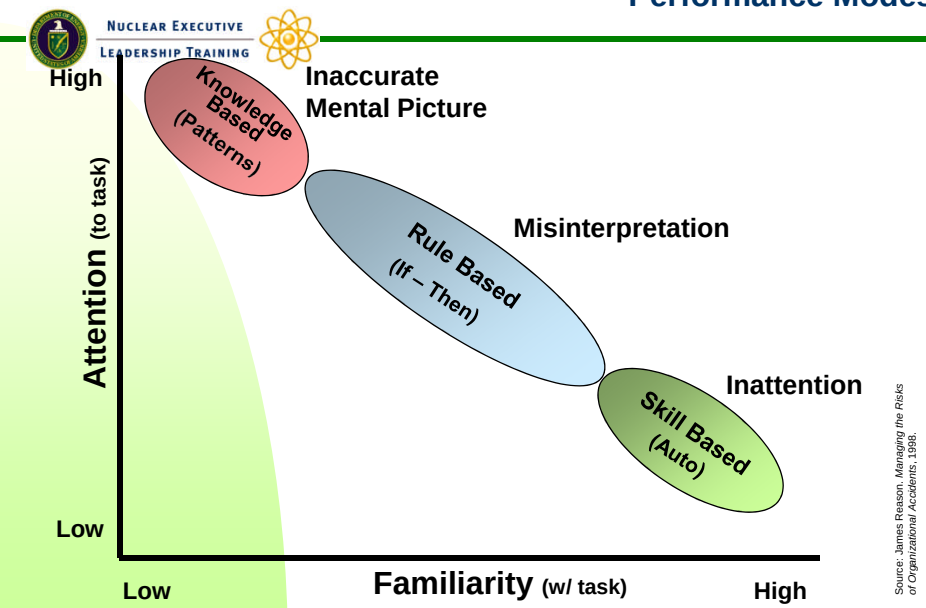
Human Information Processing



Source: Wickens, 1992

Visual Awareness "Basketball"

Performance Modes



Source: James Reason. *Managing the Risks of Organizational Accidents*, 1998.

Error Type vs. Performance Mode

- **Skill-based Errors** (25%)
  - Inattention
  - Err <1:10K (90% of activities)
- **Rule-based Errors** (60%)
  - Misinterpretation
  - Err ~1:1K (6-8% of activities)
- **Knowledge-based Errors** (15%)
  - Inaccurate Mental Model
  - Err ~1:2 (2-4% of activities)

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Error – likely Situation

Unintentional deviation from preferred behavior

Job Site Conditions
- *Task*
- *Individual*

Degree of mismatch due to *error precursors*

Source: Swain & Guttmann. *Handbook of Human Reliability Analysis with Emphasis on Nuclear Power Plant Applications*. U.S. Nuclear Regulatory Commission (NUREG/CR-1278), 1983.

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Error Precursors
short list

Task Demands	Individual Capabilities
• Time pressure (in a hurry)	• Unfamiliarity w/task / First time
• High Workload (memory requirements)	• Lack of knowledge (mental model)
• Simultaneous, multiple tasks	• New technique not used before
• Repetitive actions, monotonous	• Imprecise communication habits
• Irrecoverable acts	• Lack of proficiency / Inexperience
• Interpretation requirements	• Indistinct problem-solving skills
• Unclear goals, roles, & responsibilities	• "Hazardous" attitude for critical task
• Lack of or unclear standards	• Illness / Fatigue
Work Environment	**Human Nature**
• Distractions / Interruptions	• Stress (limits attention)
• Changes / Departures from routine	• Habit patterns
• Confusing displays or controls	• Assumptions (inaccurate mental picture)
• Workarounds / OOS instruments	• Complacency / Overconfidence
• Hidden system response	• Mindset ("tuned" to see)
• Unexpected equipment conditions	• Inaccurate risk perception (Pollyanna)
• Lack of alternative indication	• Mental shortcuts (biases)
• Personality conflicts	• Limited short-term memory

Error Prevention Tools

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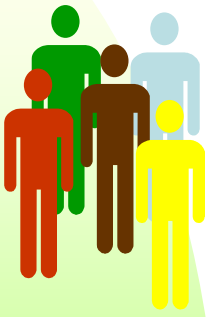
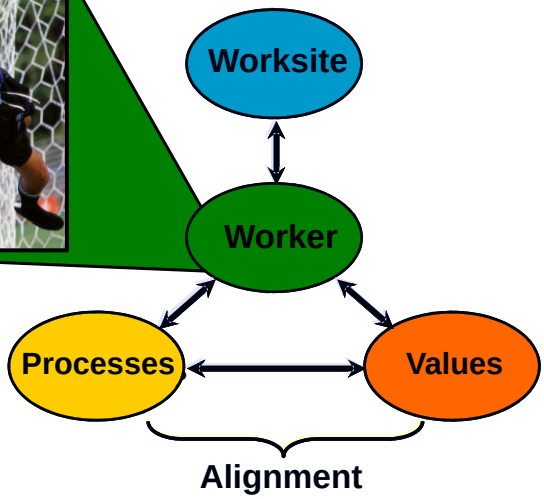
- Self-checking
- Peer-checking
- Concurrent verification
- Independent verification
- Stop if unsure
- Procedure use and adherence
- Pre-job briefing
- Post-job briefing
- Communication (3-way and phonetic alphabet)
- Questioning attitude
- Take-two
- Flagging
- Place-keeping

Managing Defenses
The Role of the **Organization**



$$R_e + M_d = \text{ØE}$$

The Last Defense!



What is the Organization's Role in Defenses?

Provide procedures, policies, programs, training, and culture to influence worker behavior.

Latent Organizational Weaknesses or Conditions

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"**Undetected deficiencies** in processes or values or equipment flaws that create workplace conditions that **provoke error** (error precursors) or **degrade the integrity of defenses** (flawed defenses)."

Defense Categories

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- **Engineered**
- **Administrative**
- **Cultural**
- **Oversight**

Reliability of Defenses

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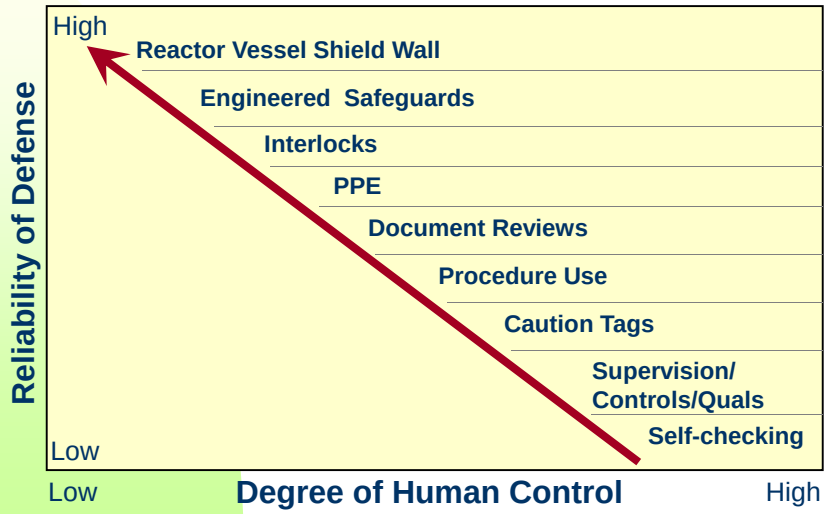

Defense-in-Depth Is Diverse and Redundant!

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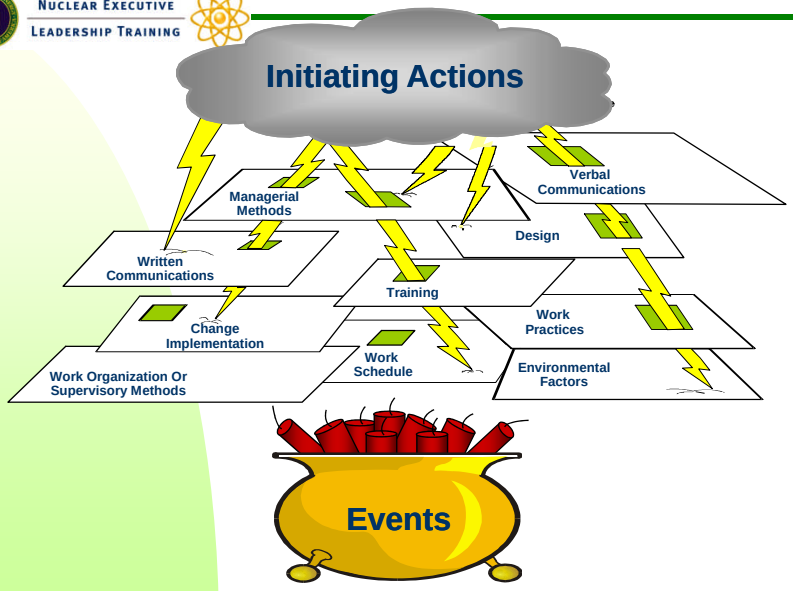
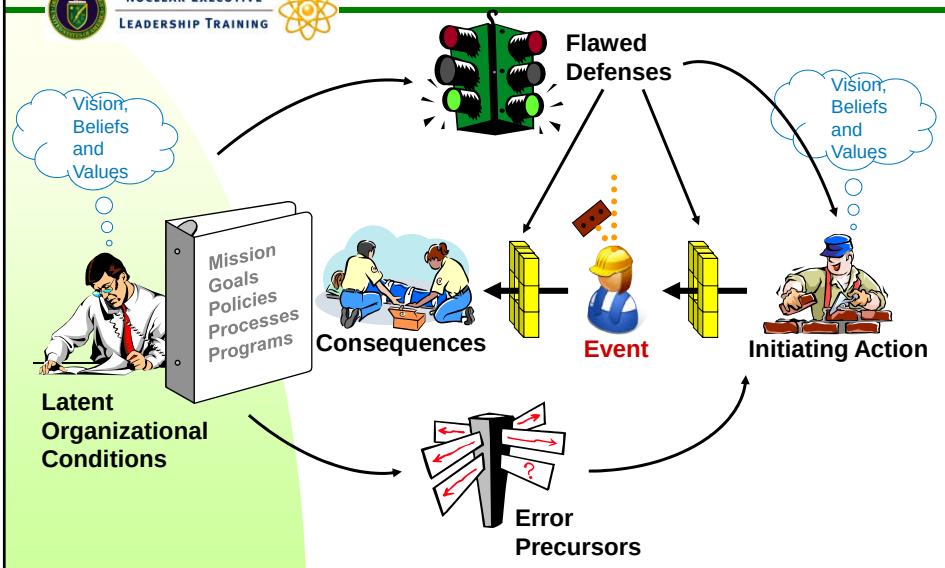


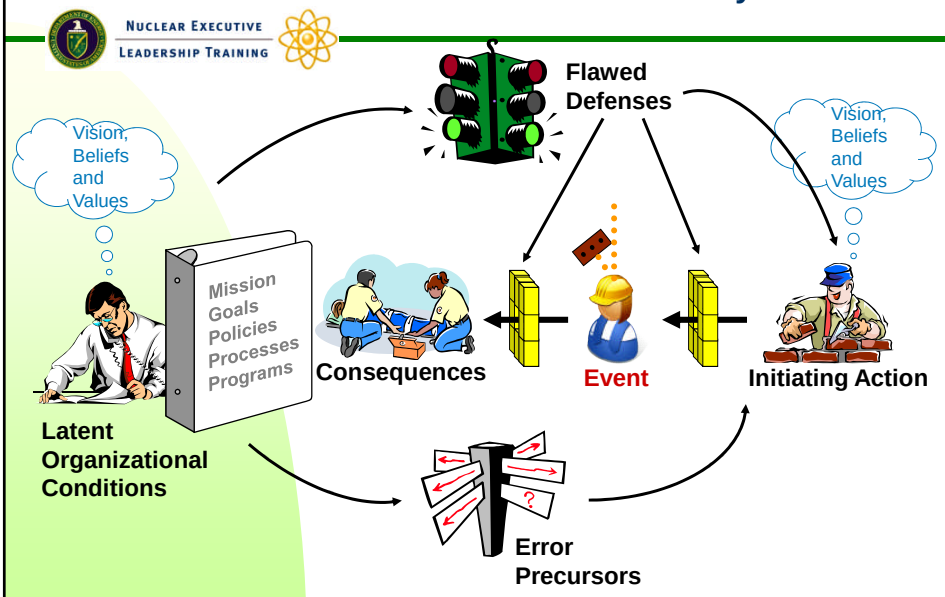
Anatomy of an Event



Sterigenics Explosion – August 2004

A Case Study from the Chemical Safety Board

Anatomy of an Event



The Rest of the Story!

Sterigenics Explosion
August 2004

Leadership & Culture

From an HPI Perspective

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Alignment

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Management

Front-line Worker

Mission

Vision

Goals

Values

Objectives Processes

Leaders

Attitudes Beliefs

Behavior (Production)

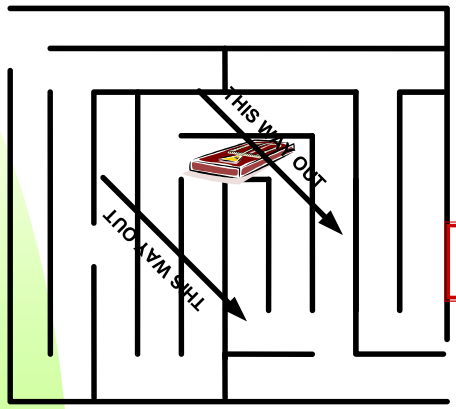
Results

Behavior (Protection)

Source: Tosti, Donald. "Changing Organizational Culture" (course), Vanguard Consulting, Inc.

How to Improve Human Performance

(Are your workers in a rat maze?)



Address Limitations of Human Nature

Remove Error Traps

Reinforce Desired Behaviors

Incentives to meet [illegible] expectations

Create Error-Tolerant Systems

How do leaders influence beliefs & values?

1. What leaders **pay attention to**, measure, or control
2. **Reactions** to critical incidents or crisis
3. Criteria used to allocate scarce **resources**
4. Deliberate attempts at role modeling, teaching, and **coaching**
5. Criteria for **reinforcement** and **discipline**
6. **Criteria used to select, promote, or terminate employees**

Source: Schein, Edgar H. *Organizational Culture and Leadership*, Jossey-Bass, 1992, p231.

A Key Principle of Human Performance

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People achieve **high levels** of performance based largely on the **encouragement and reinforcement** received from leaders, peers, and subordinates.

You get what you reinforce!

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Source: Daniels, *Bringing Out the Best in People*, 1989.

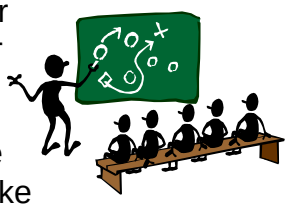
Even Tiger Woods Has a Coach!

Winner of the 2006 Grand Slam of Golf – Courtesy of msnbc.com

Coaching

The process used to help unlock another person's potential to maximize his or her own performance — to self learn.

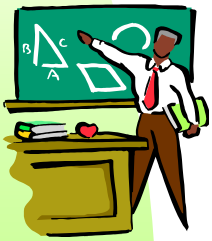
Effective coaching helps people become aware of their need for change and to take personal responsibility for taking the appropriate measures to change.



Differences:

Coaching

Counseling



Training

Leader & Organizational Toolbox

- Expectations
- Constant Themes
- Observations
- Post-Job Critiques
- Self-Assessment
- Surveys & Questionnaires

- Metrics & Indicators
- Rewards & Recognition
- Operating Experience
- Benchmarking
- Change Management

A 1999 study estimated 45k–95k people die each year due to **human error** in medical care!

"Do No Harm"

Dateline - 2003

May 1, 2006

TP NELT 9-51

Key Elements of Safety Culture
(from an HPI perspective)

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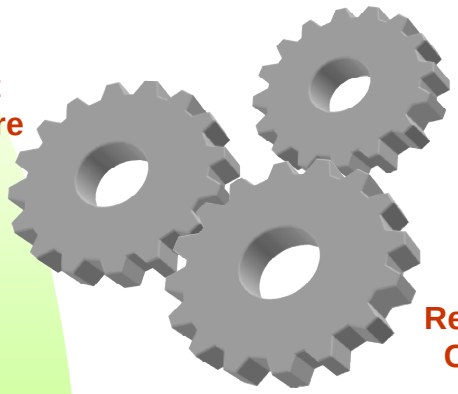

Just Culture

Learning Culture

Reporting Culture

Just Culture: **The Foresight Test**

Did the individual who committed the error engage in behavior that an average person would recognize as being likely to increase the probability of making a **safety-critical error**?

Just Culture: **The Culpability Test**

Culpability is likely if the answer is YES to any of the following:

- **Working under the influence** of a substance that impairs performance
- **Clowning around** while driving potentially damaging equipment (or safety-related activity)
- **Taking unwarranted shortcuts** like signing off jobs prematurely
- **Using** tools, parts or equipment **known to be sub-standard or inappropriate**

Just Culture: **The Substitution Test**

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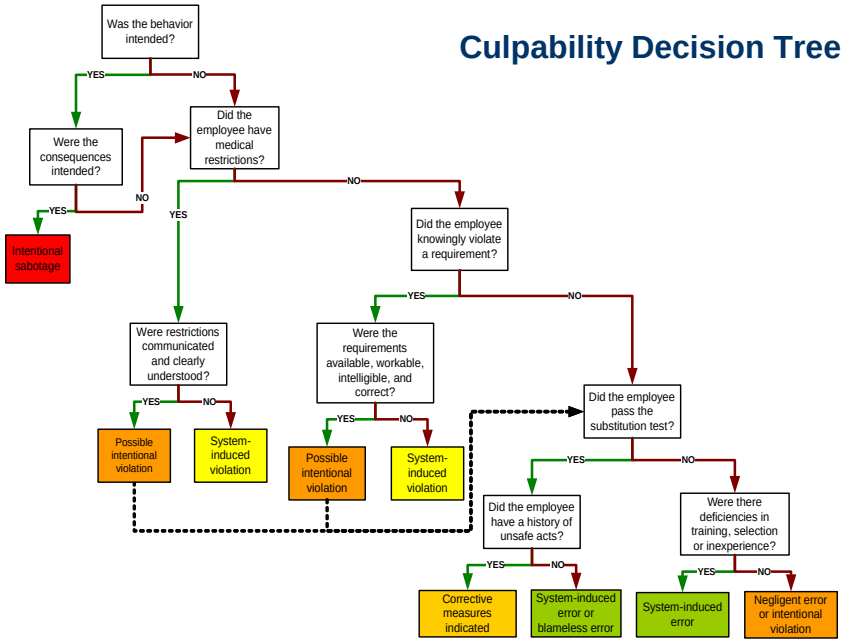
Replace the individual with another of comparable training & experience:

"Given the situation in which the event occurred, could you be sure that they would not have committed the same or a similar type of unsafe act?"

If the answer is '**NO**'--then blame is likely to be inappropriate

Culpability Decision Tree



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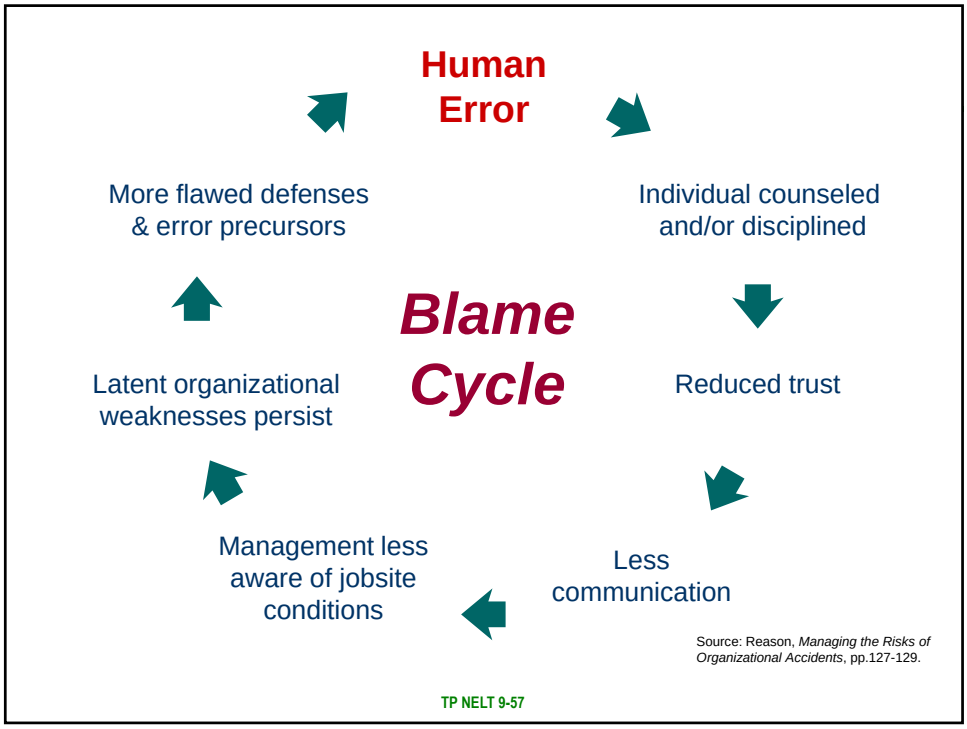

Source: Reason, *Managing the Risks of Organizational Accidents*, pp.127-129.

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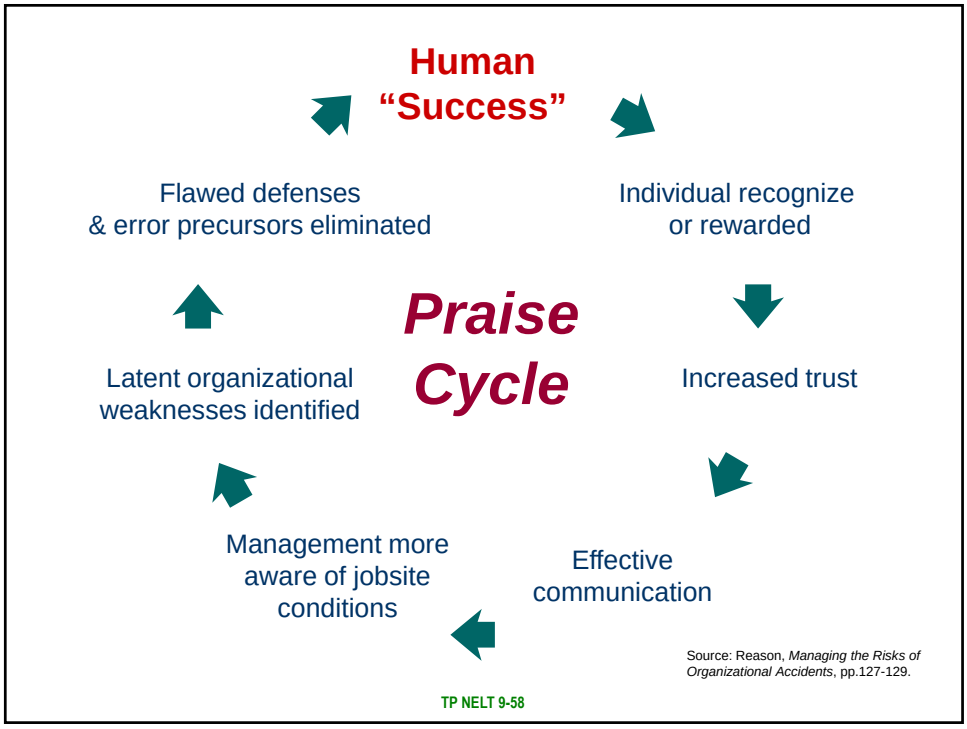

Source: Reason, *Managing the Risks of Organizational Accidents*, pp.127-129.

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A Just Culture Means Getting the Balance Right!

Zero Tolerance
for reckless conduct (bad acts)

widespread confidence that the vast majority of unintended acts resulting in unacceptable consequences will go unpunished (honest errors).

High Reliability Organization Theory and HPI

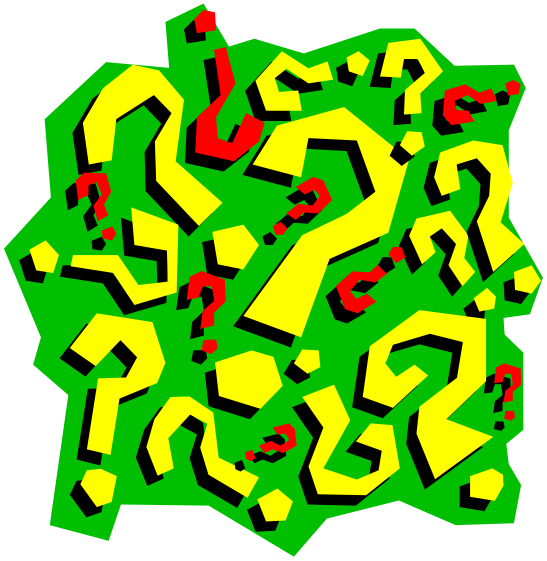
- 1989 – HRO "discovered" – what characteristics do high performing organizations share in common?

  "An HRO expects its organization and its sub-systems will fail, and people work very hard to avoid failure, while preparing for the inevitable, so that they can minimize the impact of failure."

- Mid 1990's – HPI developed – practical resources to anticipate and adapt to uncertainty

- Today – HRO & HPI give us theory plus practical methods and tools

Questions?



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